A view on Air Traffic Management today

KIVI – 22 March 2016

MovingDot - Experts in Air Traffic Management

Presentation tonight..

Content

- Short introduction MovingDot

- A look at the situation today

- What is being done?

- How will air traffic management look tomorrow?

- And the future -> Jacco Hoekstra

About us

- Independent consultancy firm; limited liability company (B.V.)

- Founded in 2010 and operated by former senior management of LVNL (Air Traffic Control the Netherlands)

- Staff of 12 experts with an additional 8 operational ATC experts

- Offices at Hoofddorp (NL) and Houston, Texas (USA)

- In-depth understanding of ATM policy and operational affairs

- Specialized in complex international projects with many stakeholders

- Closely linked to aerospace engineering and certification expertise of ADSE and AQE (as part of ADSE Holding BV)

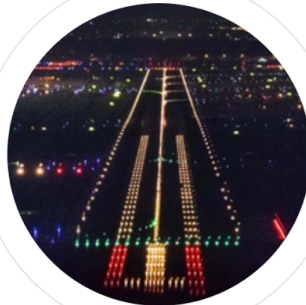- Member of the Civil Air Navigation Services Organization (CANSO)

canso
civil air navigation services organisation

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Our primary services..

Experts in air traffic management

www.movingdot.com
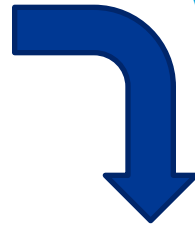
Design and Development

Safety Management

Performance Enhancement

Policy advice

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MovingDot at a glance..

ATM Strategy

Airspace & route development

TWR development

Airport Master Plan

Safety Management & assessments

ATC Procedure design & development

Operational Performance enhancement

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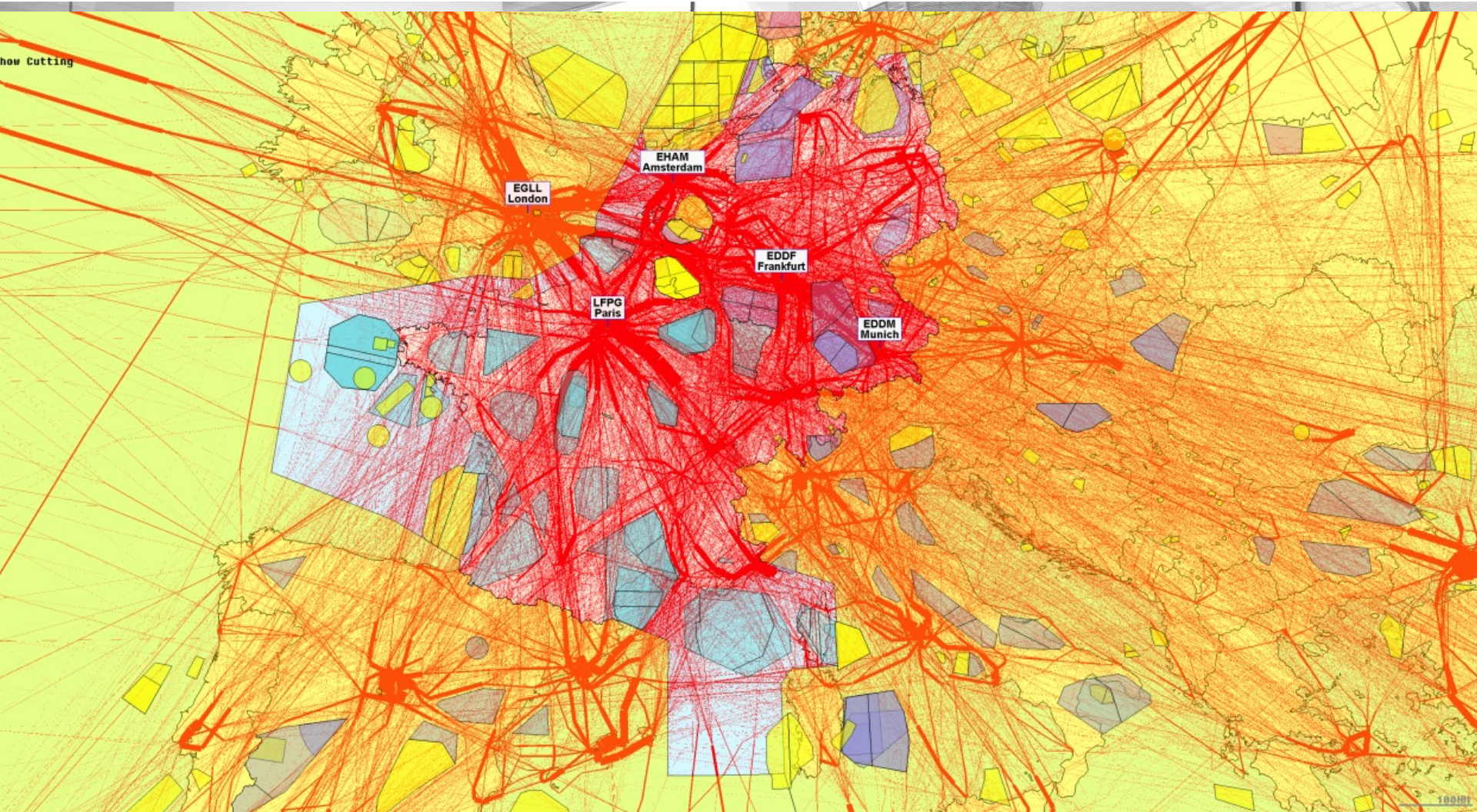
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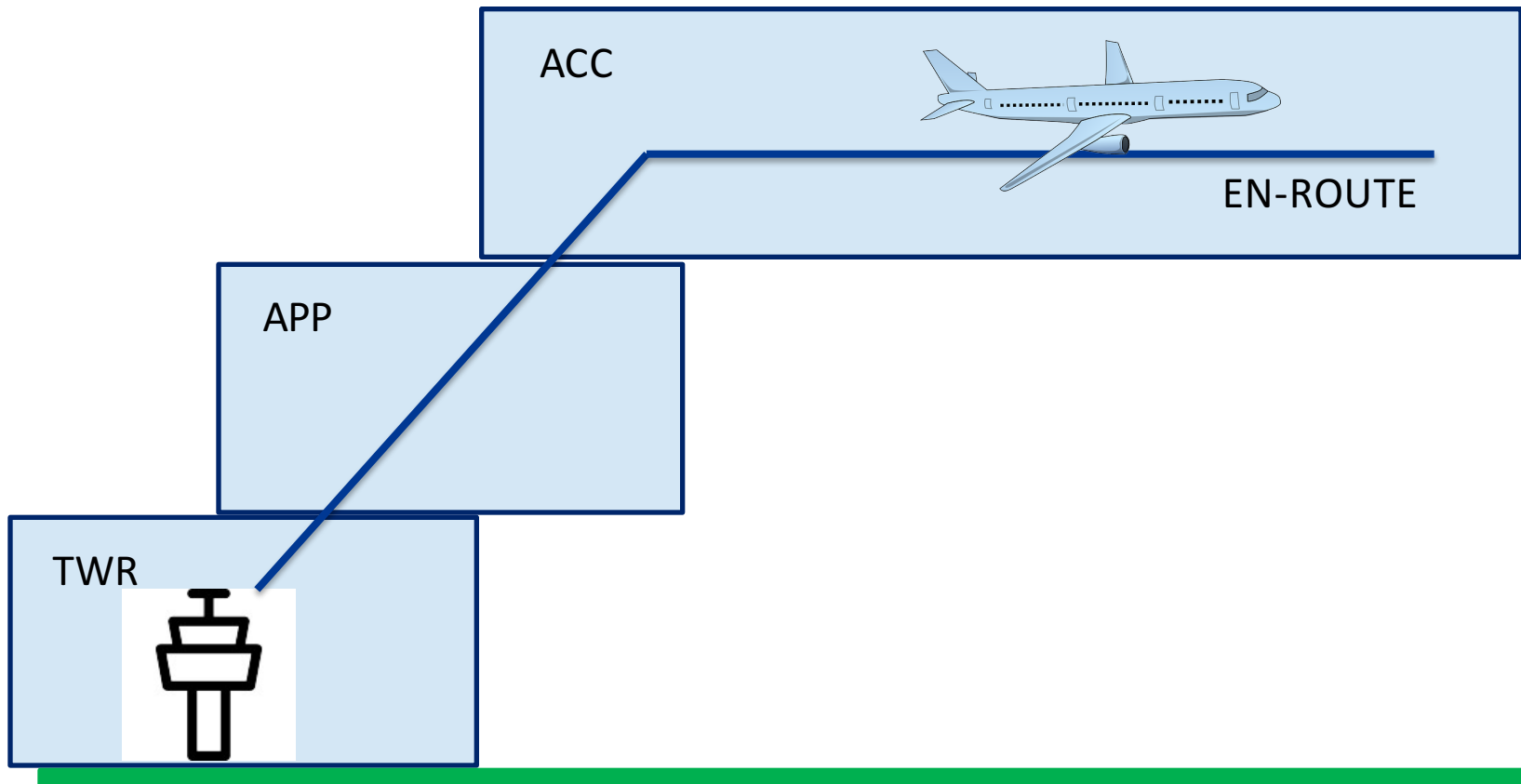
Number of flights over Europe, each day..

IFR Flights/Day in ECAC

Legend:
- 2015 Actual
- 2015 Wide Forecast
- 2015 Central Forecast
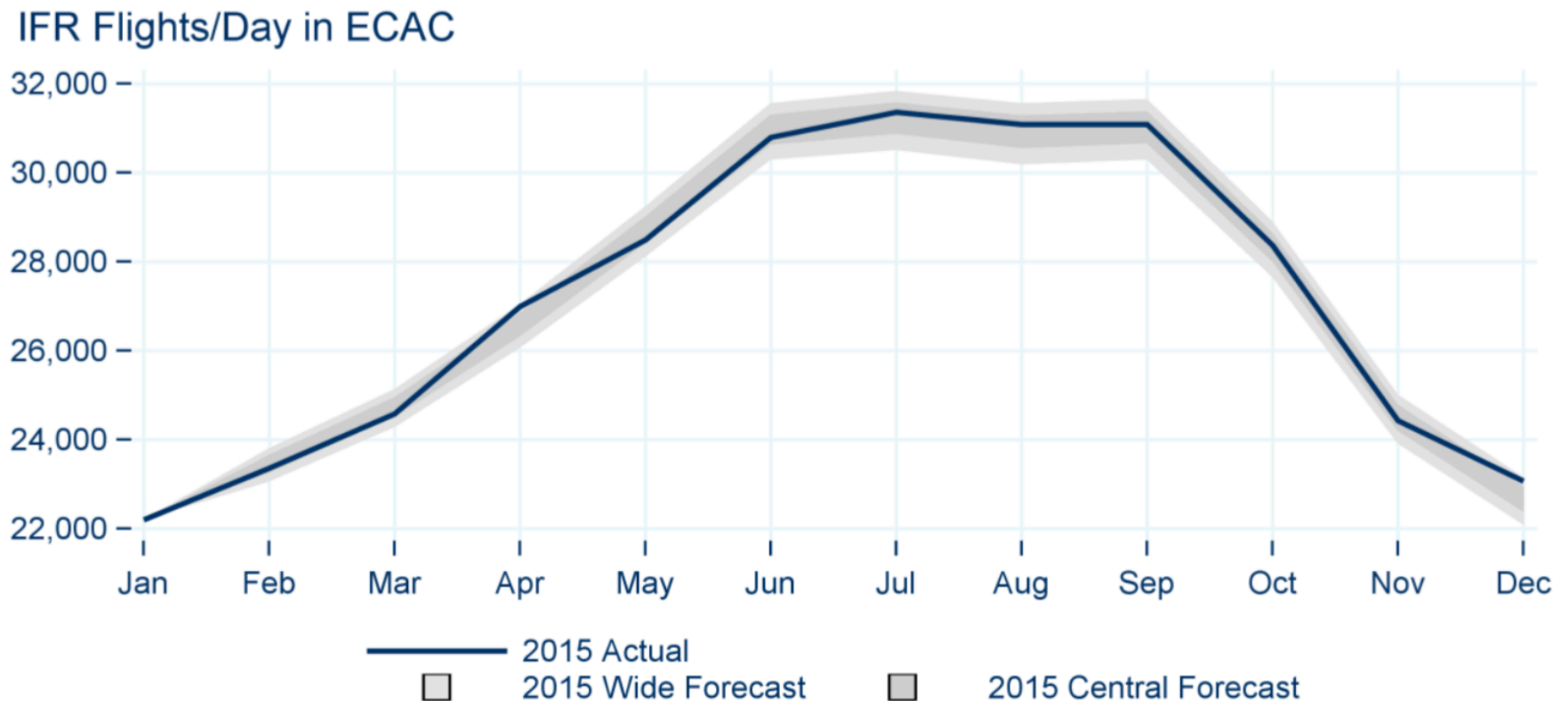
©EUROCONTROL 2016 www.eurocontrol.int/STATFOR

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Current European traffic & MIL airspace

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Aircraft controlled by different Centres

ACC

EN-ROUTE

APP

TWR

Even multiple Air Navigation Service Providers

Eurocontrol Maastricht Upper Airspace Centre (MUAC)

Overflights

FL245

ACC

Initial Approach Fix

Luchtverkeersleiding NL (LVNL)

Schiphol Approach

Schiphol TWR

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Jever High Sector FL345+

Jever Sector

Holstein Sector
FL345+

Delta High Sector
FL345+

Delta Sector

Celle High Sector
FL335+

Celle Sector

Münster High Sector
FL335+

Münster Sector

Solling High Sector
FL335+

Solling Sector

Ruhr High Sector
FL335+

Ruhr Sector

Koksy High Sector

Koksy Sector

Brussels West High
Sector FL335+

Nicky High Sector

Nicky Sector

Olno High Sector

Olno Sector

Brussels East High
Sector FL335+

Lux High Sector

Lux Sector

Politics can have long-lasting effects..

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Airspace structure follows national boundaries

© MovingDot, Experts in Air Traffic Management
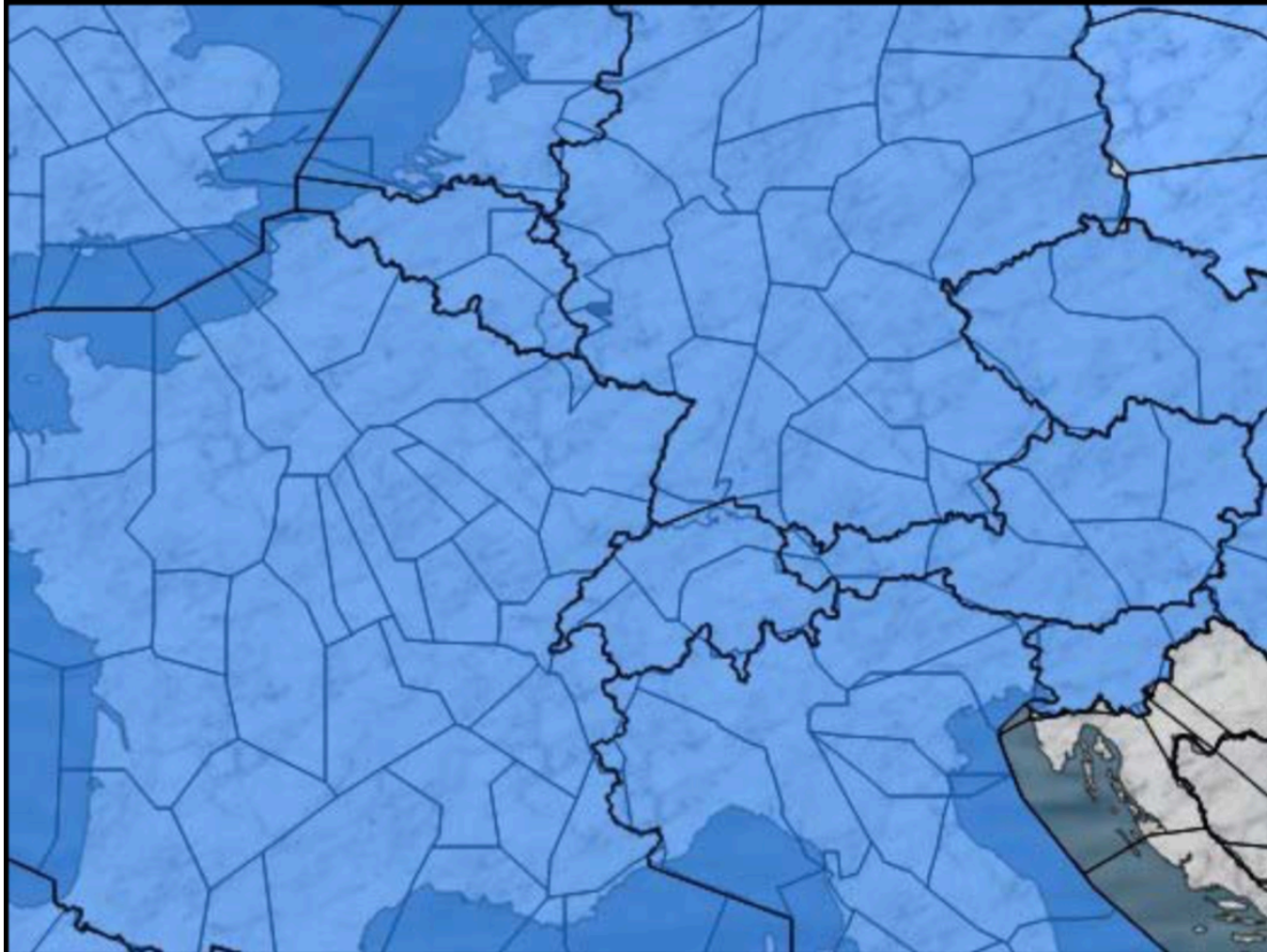
The busiest routes have to avoid military areas

Courtesy Ben Pirard, CC BY-SA 3.0
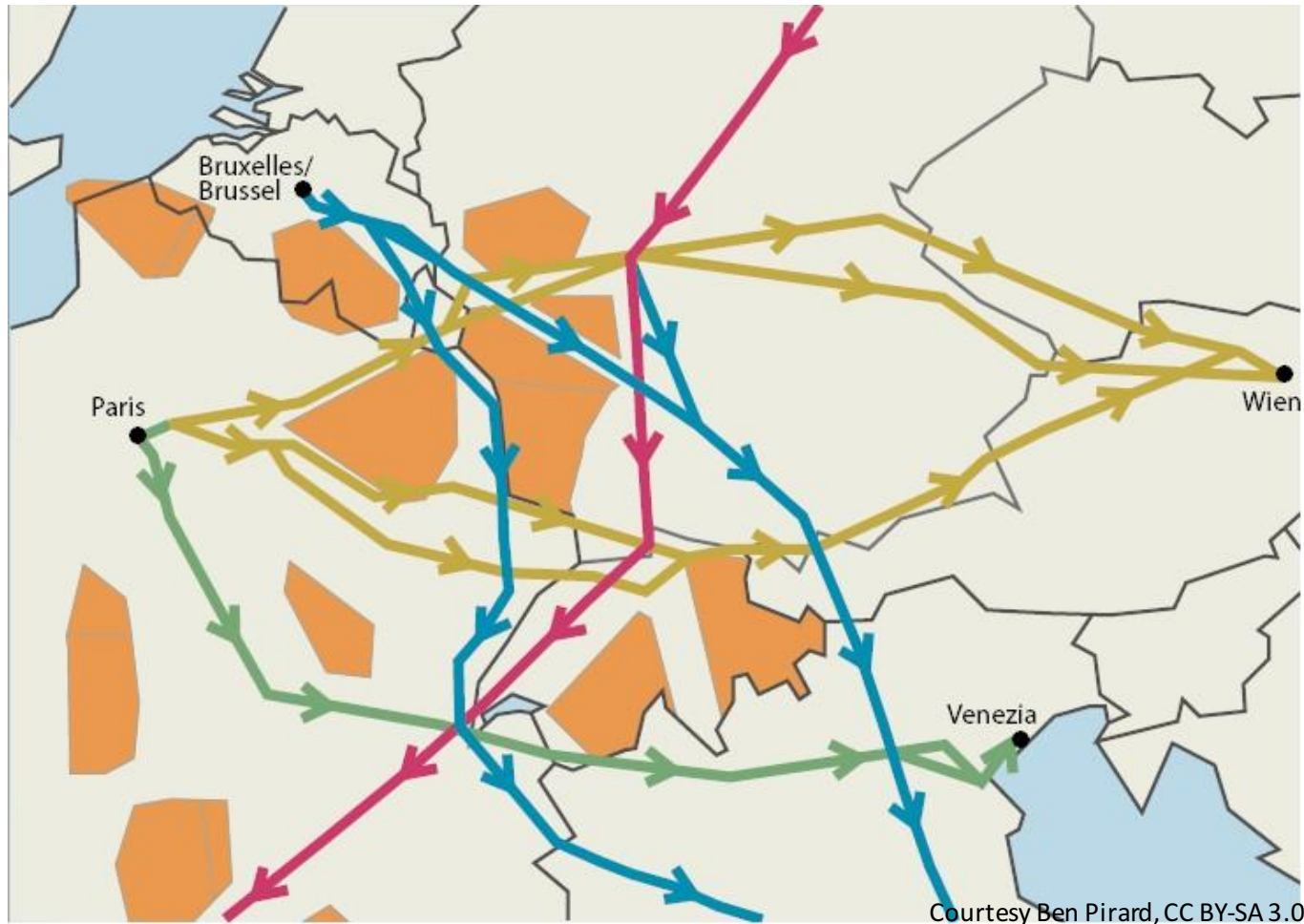
.. with unplanned route extensions

© MovingDot, Experts in Air Traffic Management

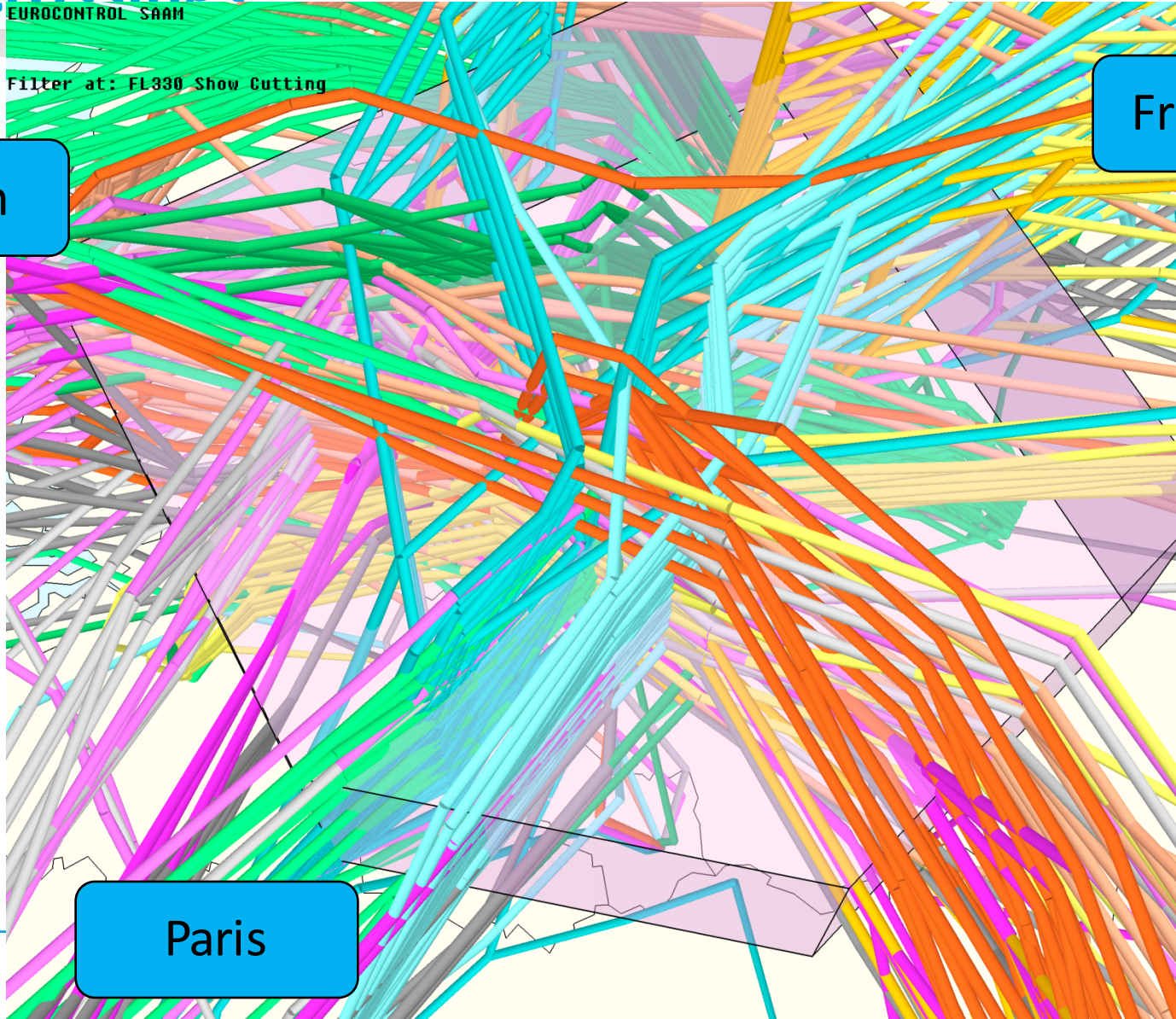# ..with too many flows and too many crossings!

EUROCONTROL SAAM

Filter at: FL330 Show Cutting

London

Frankfurt

Paris

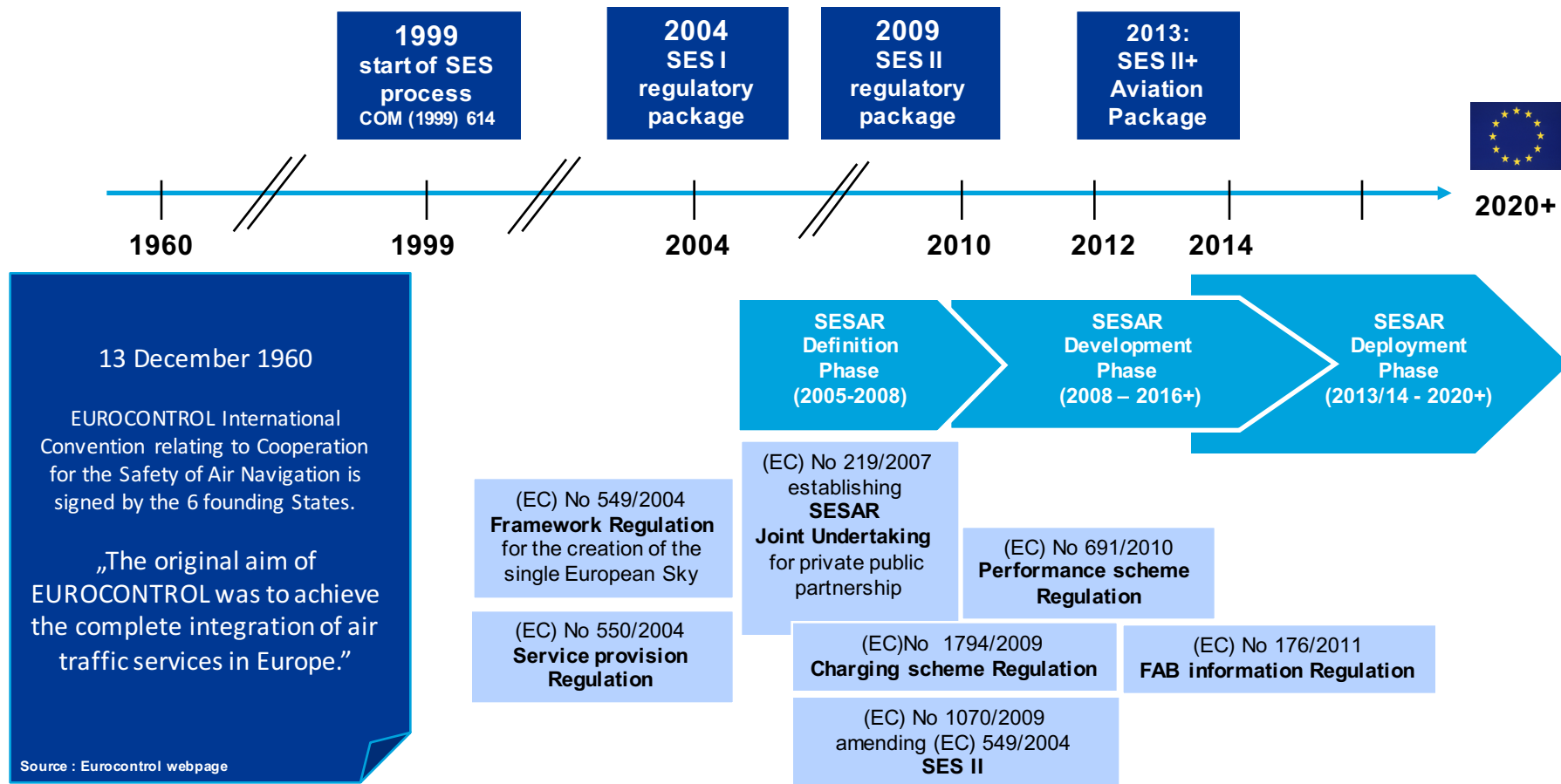moving dot

Sources of economies

	Cause of fragmentation	Annualised costs	% of cost of fragmentation
Common issues	Piecemeal procurement (mainly ATM systems)	€30m - €70m	**14%**
	Sub-optimal scale in maintenance and in-service development (mainly CNS)	€10m - €15m	
	Fragmented planning	€60m - €120m	
ACCs	Economies of scale in ACCs (operating costs)	€370m - €460m	**53%**
	Economies of scale in ACCs (capital cost)	€105m - €140m	
	Constrained sector design (flight efficiency benefits)	€50m - €100m	
ATM systems	Lack of common systems (operating costs)	€150m - €215m	**23%**
	Lack of common systems (capital costs)	€30m - €90m	
	Increased coordination at interfaces	€10m - €20m	
CNS infrastructure	Optimum location of en-route navaids	€3m - €7m	**4%**
	Overprovision of secondary radar	€15m - €60m	
Associated support	Economies of scale in training, administrative costs and R&D	€40m - €100m	**6%**
	Total costs of fragmentation	€880m - €1400m	**100%**

Source : EUROCONTROL PRC

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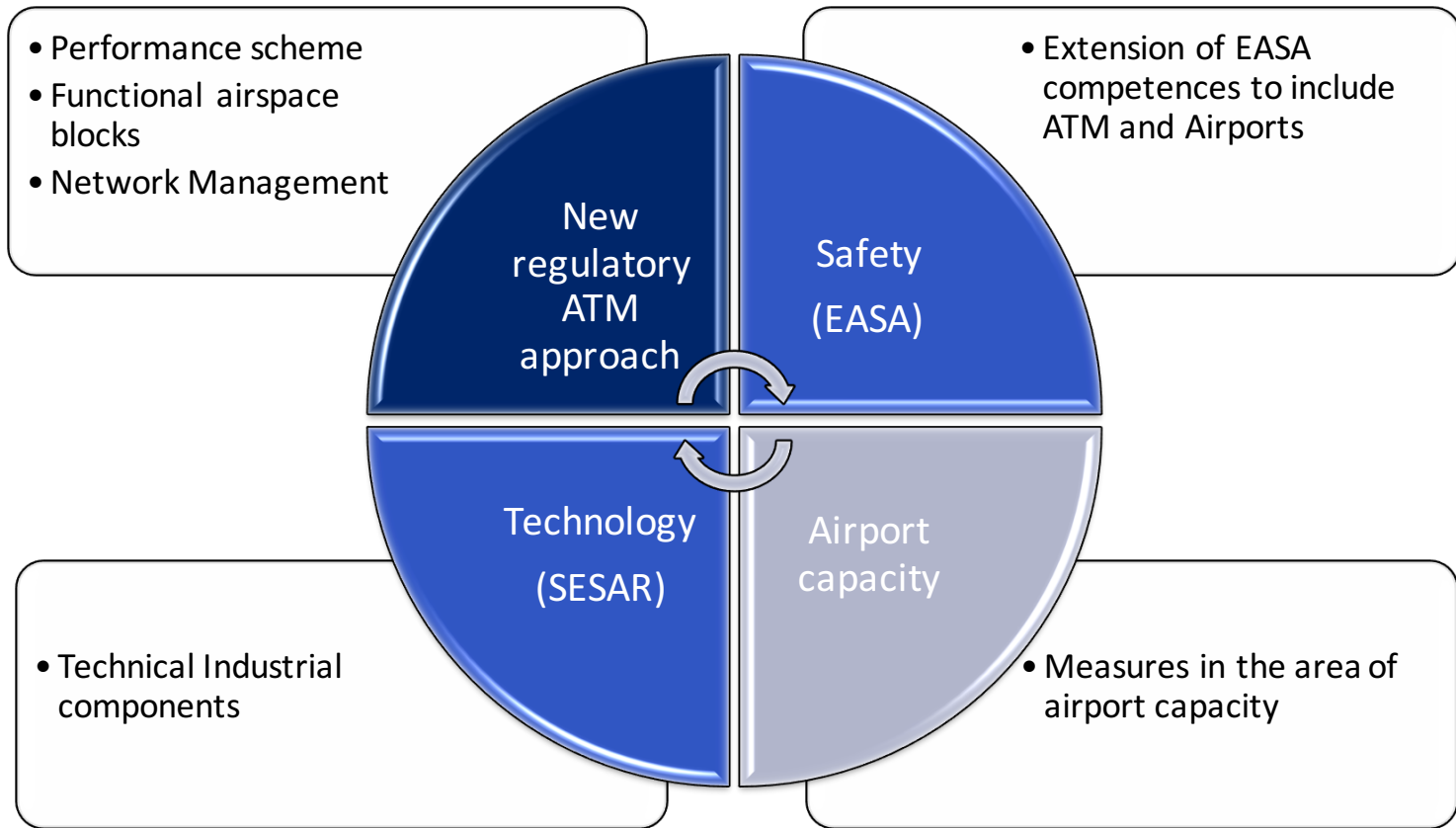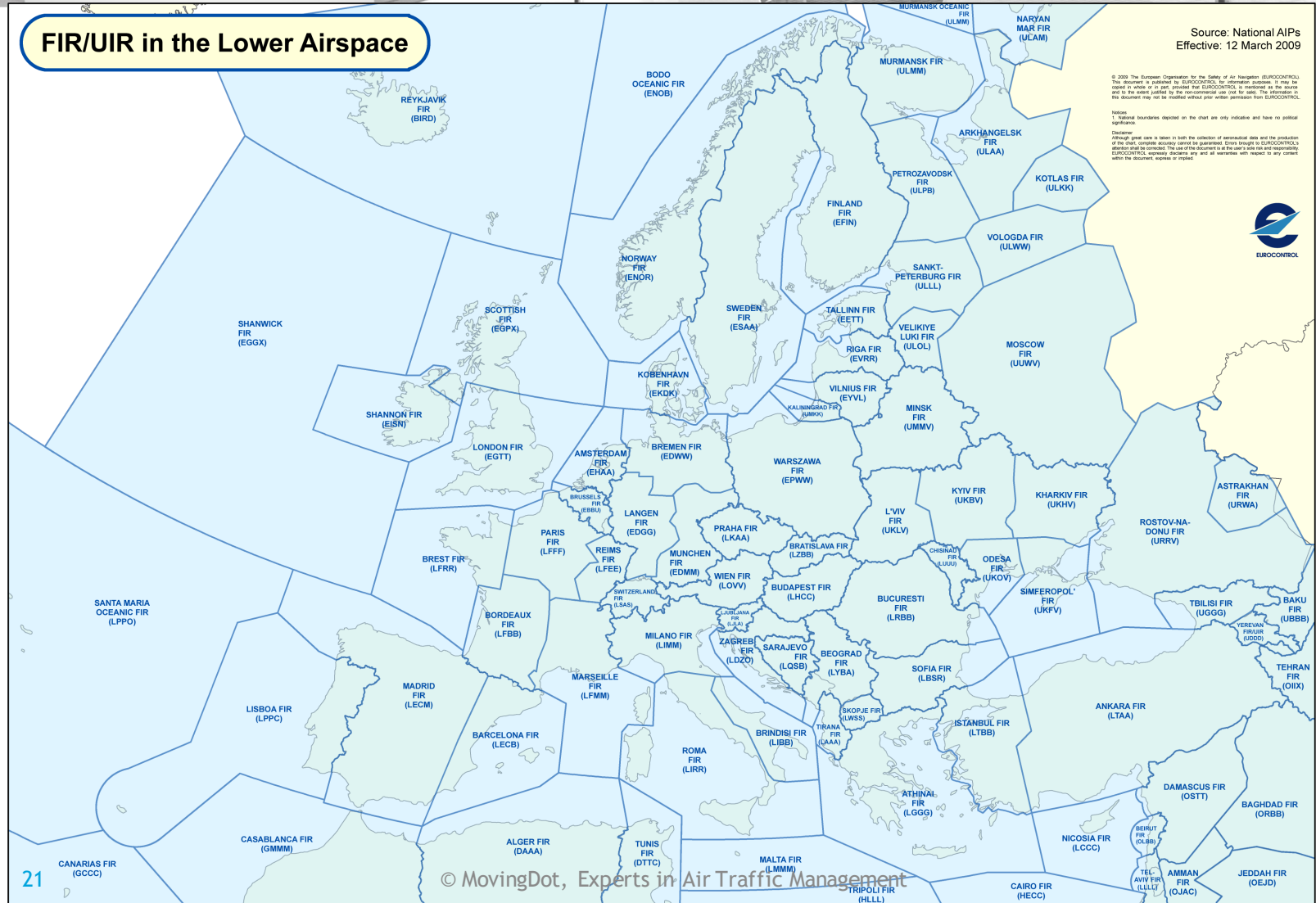
- And the future -> Jacco Hoekstra

Single European Sky

1999
start of SES process
COM (1999) 614

2004
SES I
regulatory package

2009
SES II
regulatory package

2013:
SES II+
Aviation Package

2020+

1960 — 1999 — 2004 — 2010 — 2012 — 2014

13 December 1960

EUROCONTROL International Convention relating to Cooperation for the Safety of Air Navigation is signed by the 6 founding States.

„The original aim of EUROCONTROL was to achieve the complete integration of air traffic services in Europe."

Source : Eurocontrol webpage

SESAR Definition Phase (2005-2008)

SESAR Development Phase (2008 – 2016+)

SESAR Deployment Phase (2013/14 - 2020+)

(EC) No 549/2004
Framework Regulation for the creation of the single European Sky

(EC) No 550/2004
Service provision Regulation

(EC) No 219/2007 establishing **SESAR Joint Undertaking** for private public partnership

(EC) No 691/2010
Performance scheme Regulation

(EC)No 1794/2009
Charging scheme Regulation

(EC) No 176/2011
FAB information Regulation

(EC) No 1070/2009 amending (EC) 549/2004
SES II

Examples; not all applicable SES regulation shown. Complete list "Report on the SES Legislation Implementation, Ch. 1.3, EUROCONTROL June 2012

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The 4 Pillars of the Single European Sky

The European Commission plan: "The Aviation Package"

- Performance scheme
- Functional airspace blocks
- Network Management

- Extension of EASA competences to include ATM and Airports

New regulatory ATM approach

Safety (EASA)

Technology (SESAR)

Airport capacity

- Technical Industrial components

- Measures in the area of airport capacity

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Current European Airspace

FIR/UIR in the Lower Airspace

Source: National AIPs
Effective: 12 March 2009

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Functional Airspace Blocks (FABs)

Defragment the European Airspace structure

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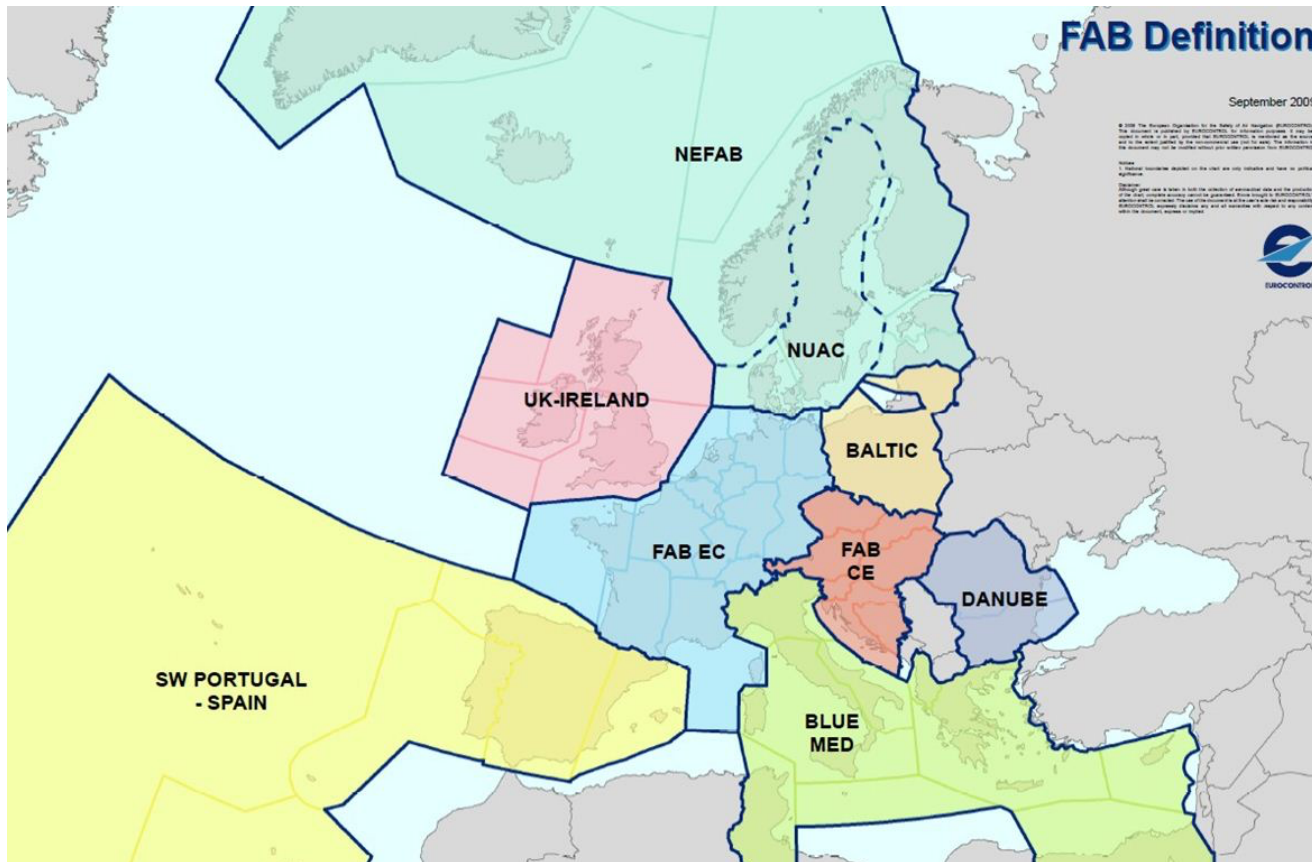
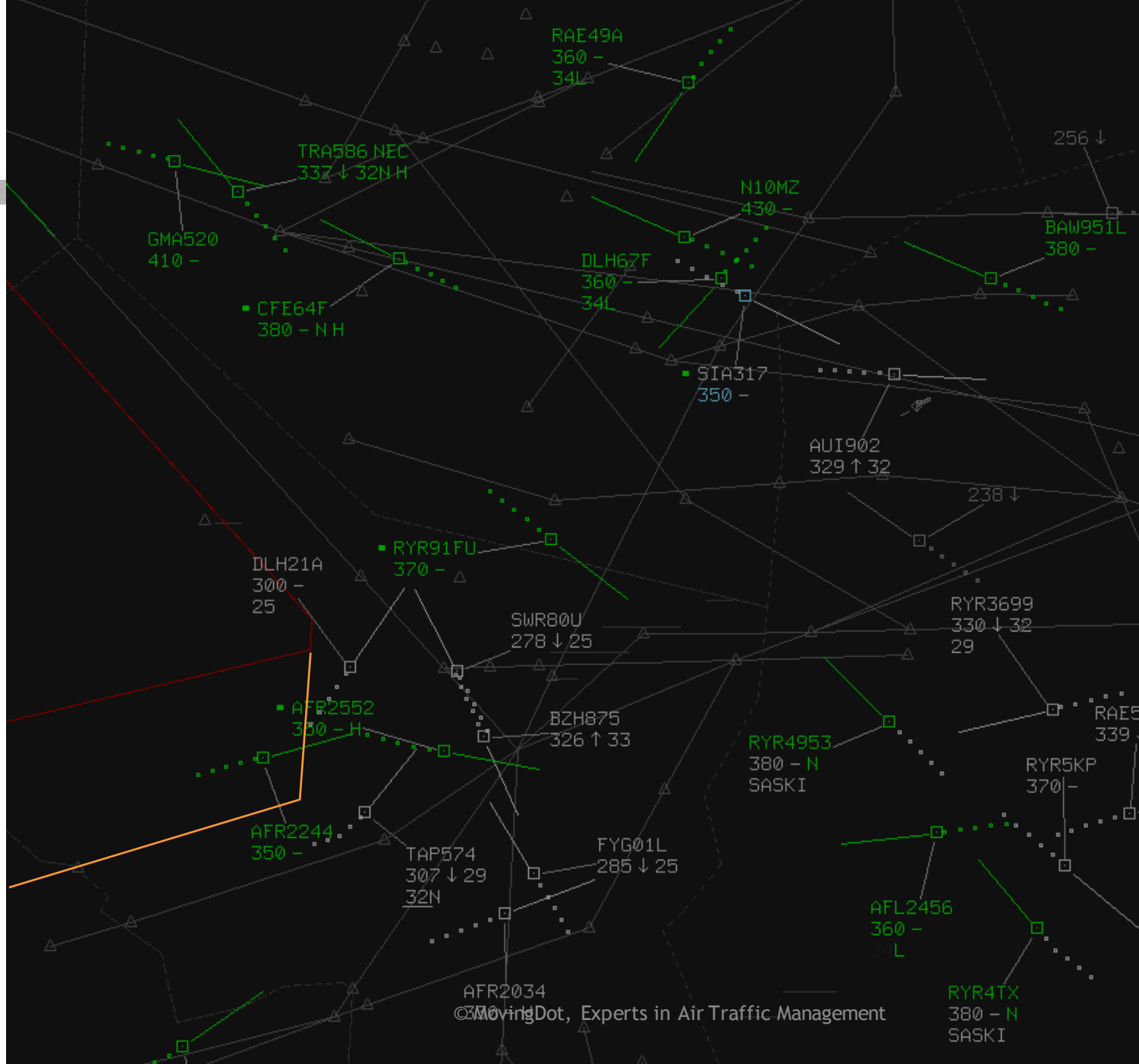# Functional Airspace Block Europe Central

What actually is the problem..?
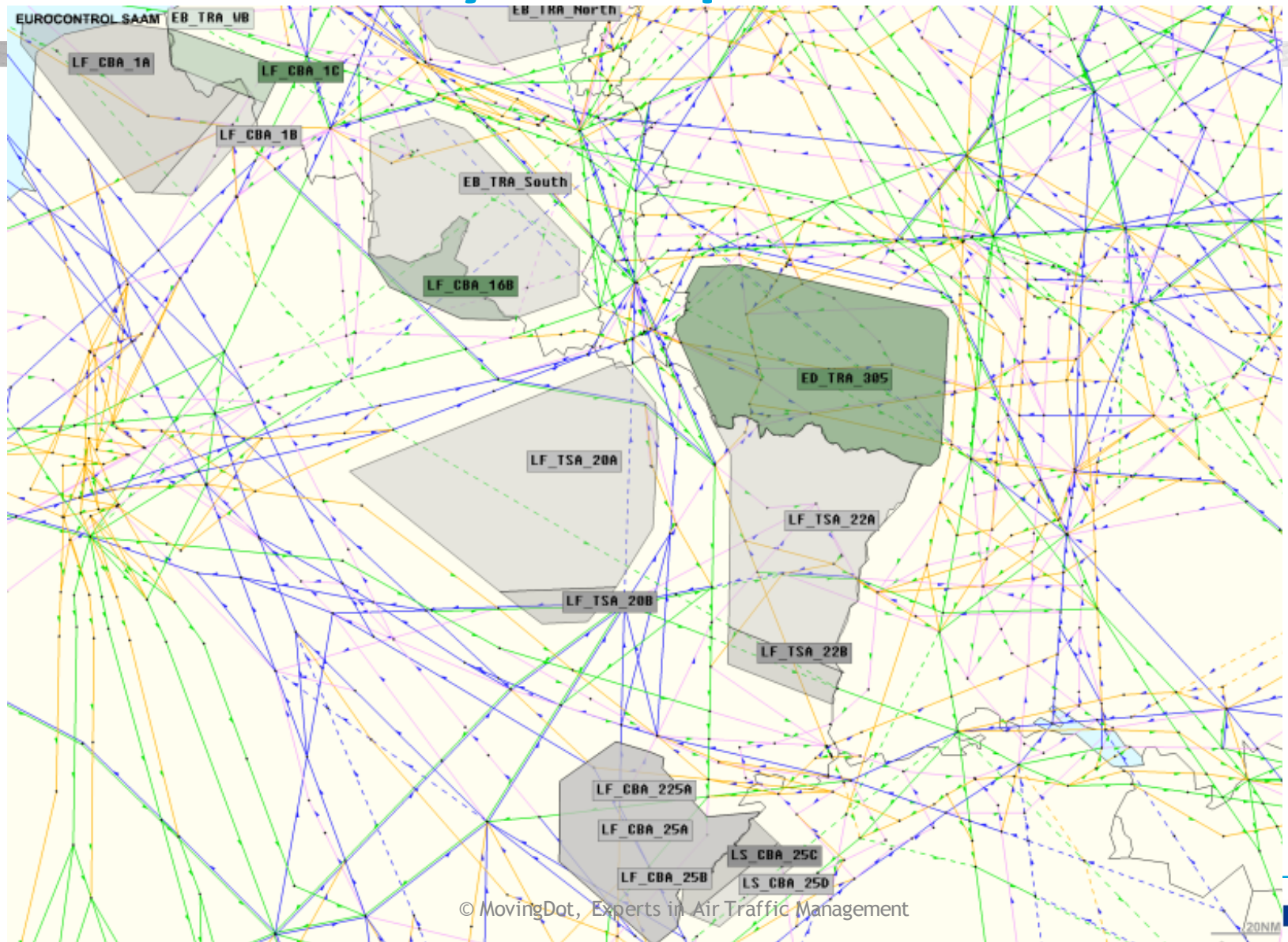
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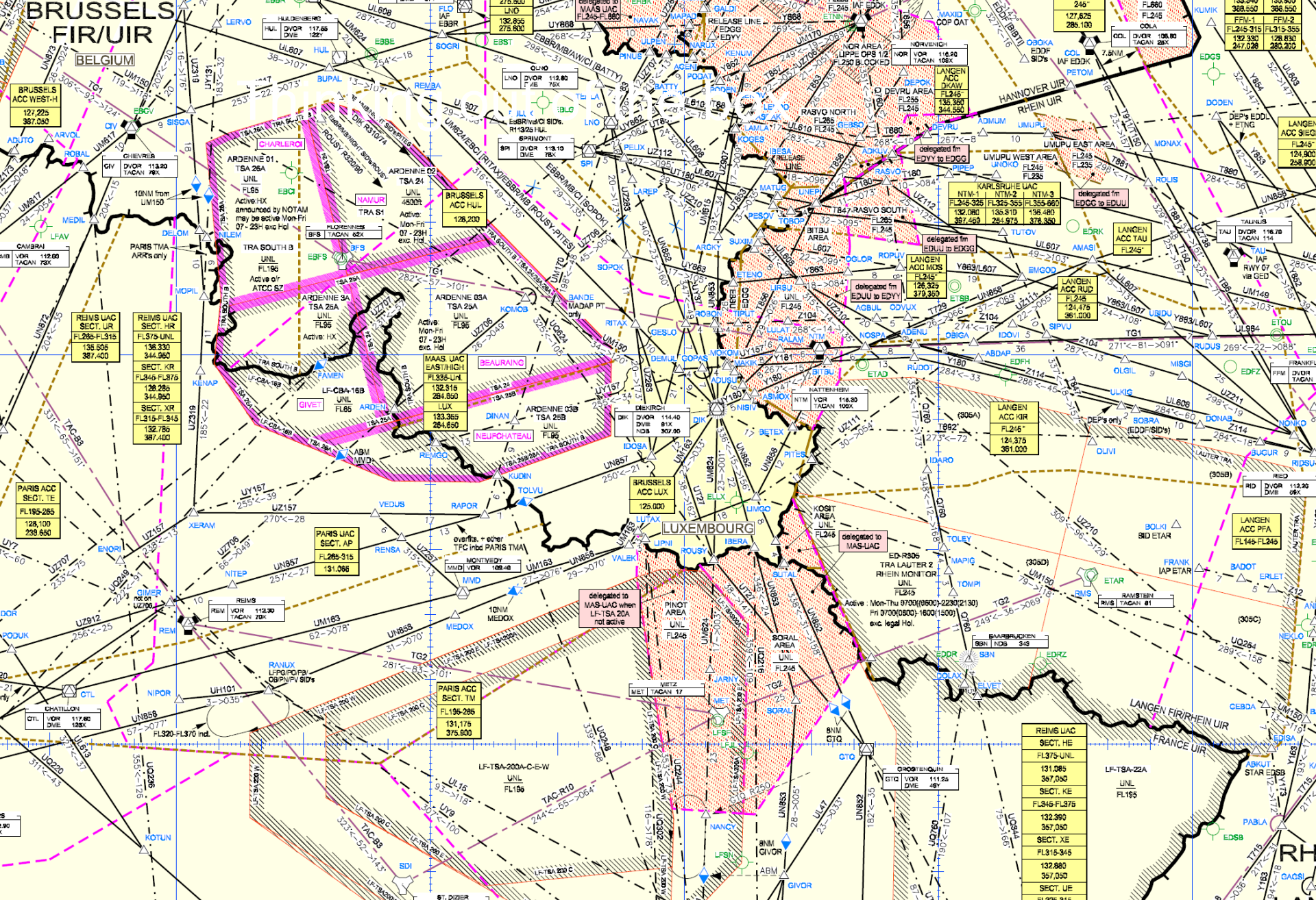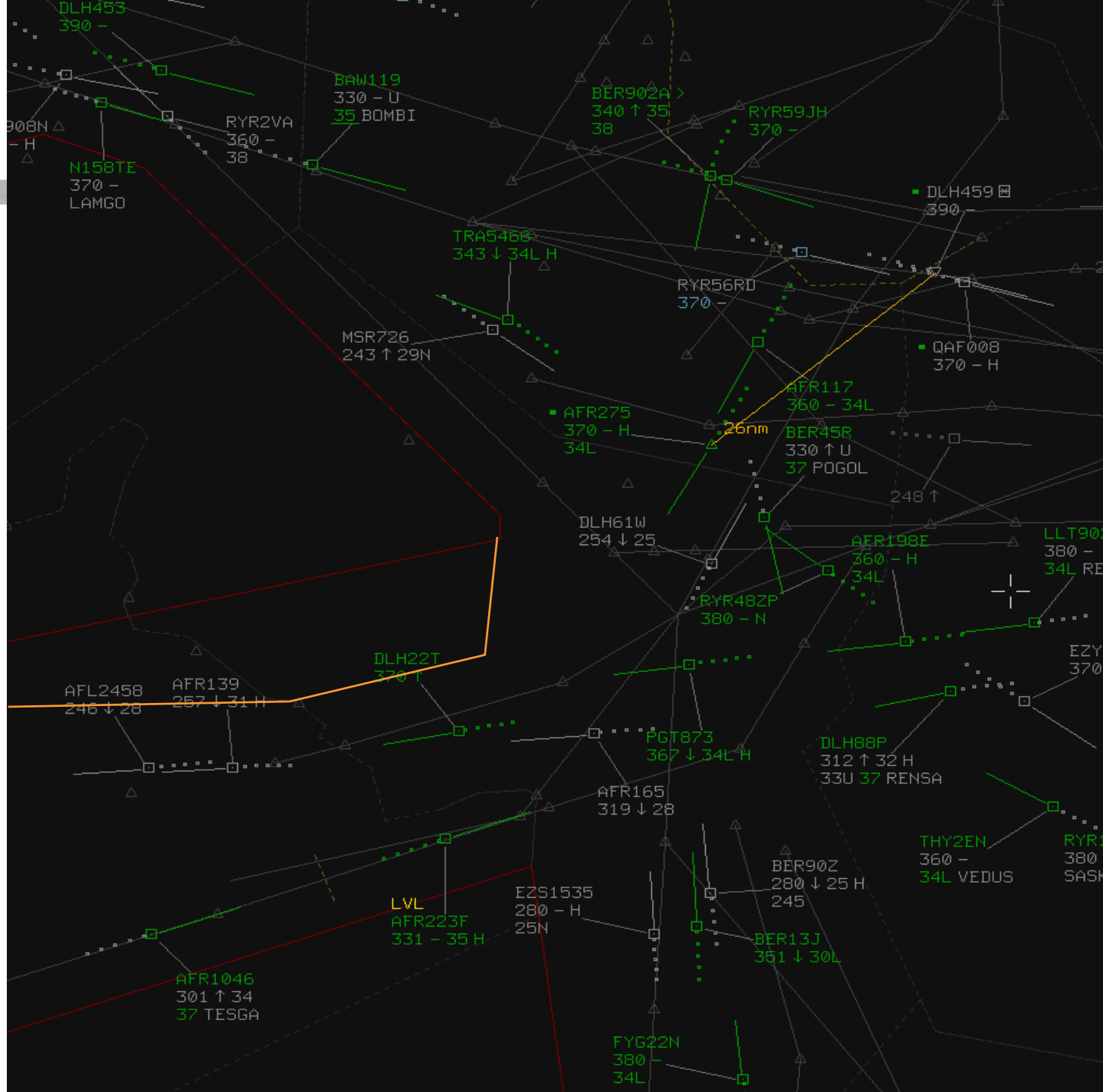
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Organisaties
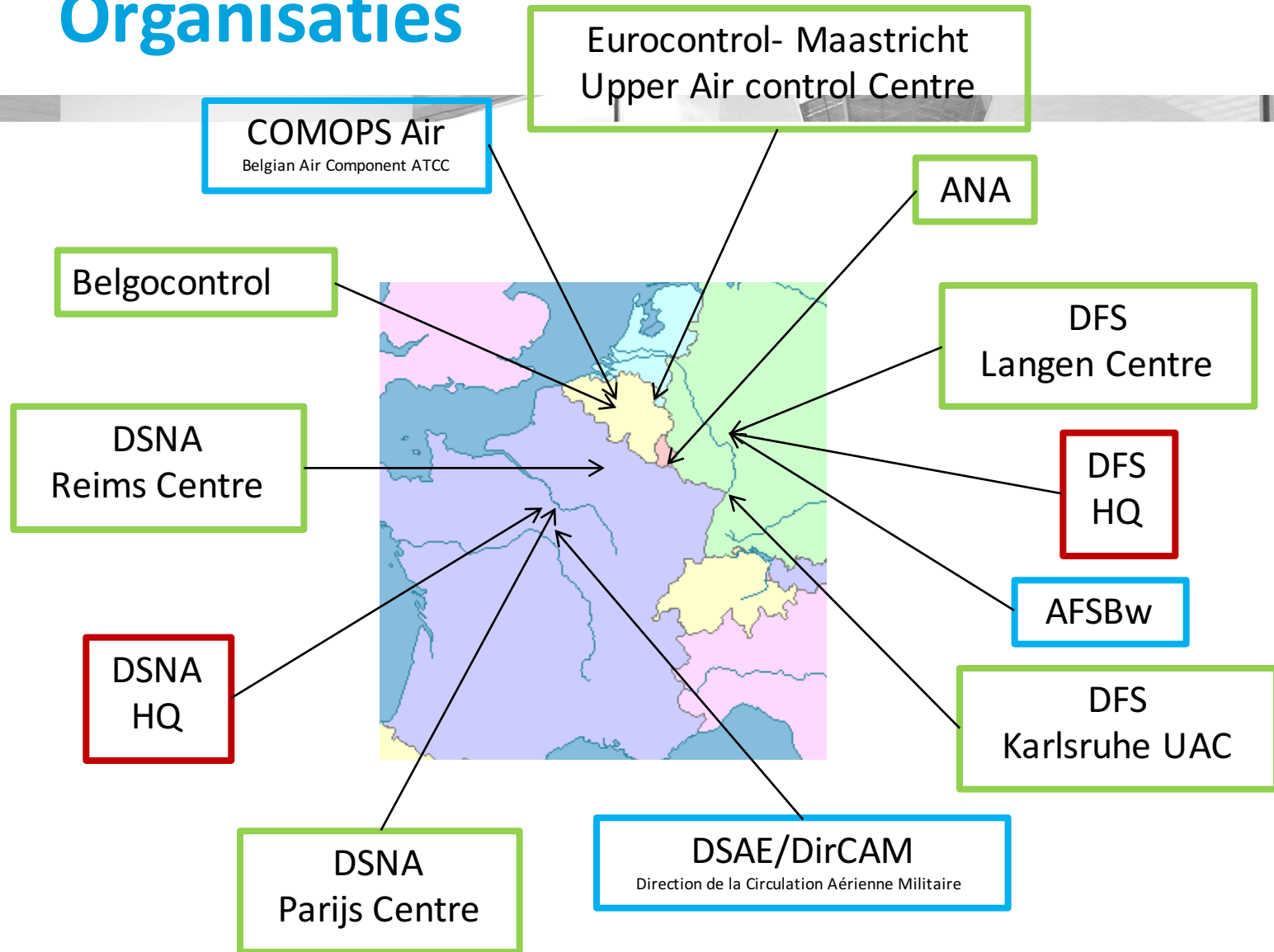
Eurocontrol- Maastricht
Upper Air control Centre

COMOPS Air
Belgian Air Component ATCC

ANA

Belgocontrol

DFS
Langen Centre

DSNA
Reims Centre

DFS
HQ

DSNA
HQ

AFSBw

DFS
Karlsruhe UAC

DSNA
Parijs Centre

DSAE/DirCAM
Direction de la Circulation Aérienne Militaire

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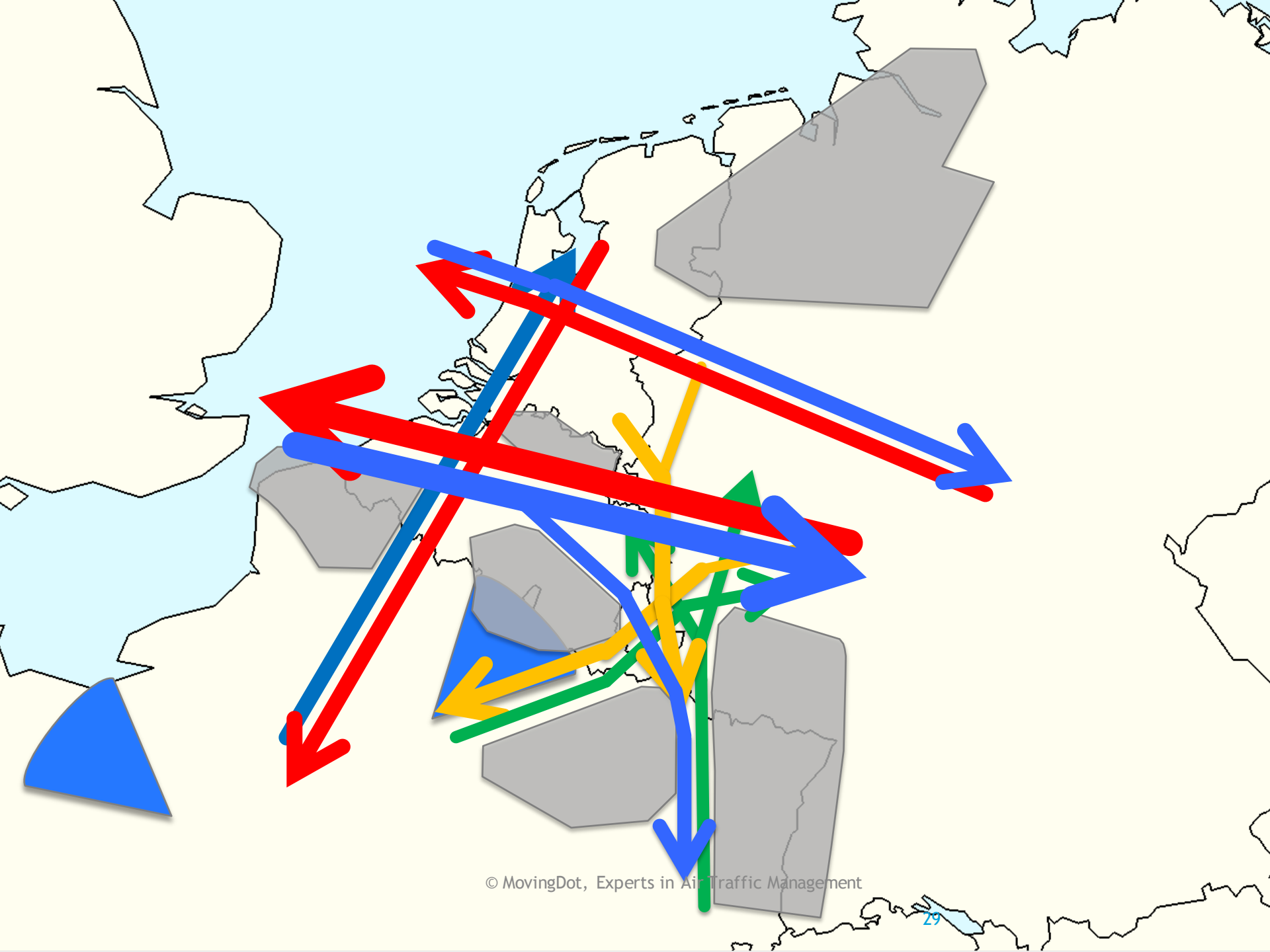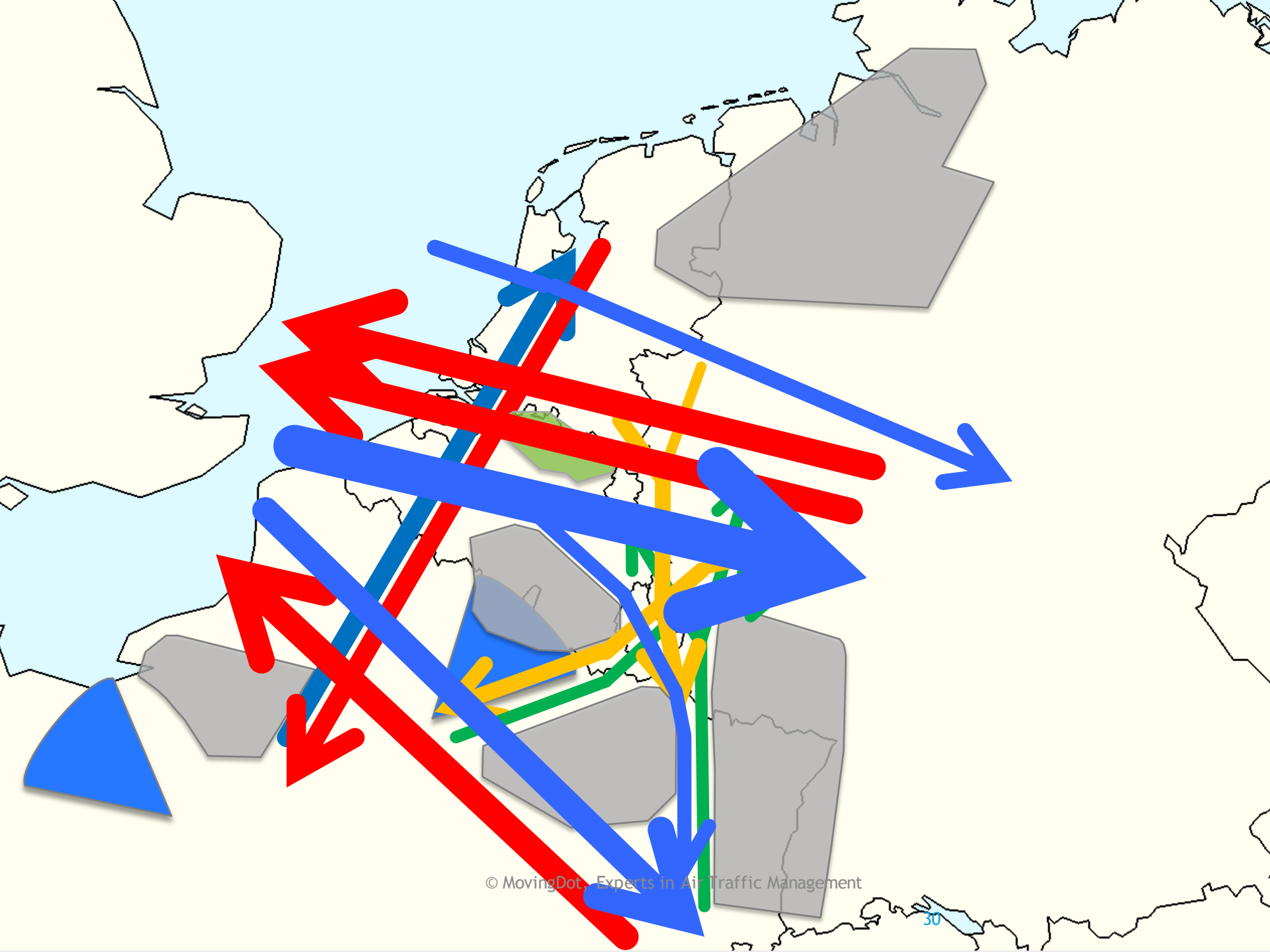© MovingDot – Experts in Air Traffic Management

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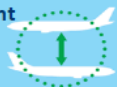
- And the future -> Jacco Hoekstra

The Concept of Operations

Satellite based Communication & Navigation

Advanced Flexible Use of Airspace

Complexity Assessment & Resolution

Cruise climb

Collision Avoidance Monitoring

Airborne Spacing & Separation

Extended AMAN

Time based separation
Point Merge
AMAN & Point Merge

Business & Mission trajectory
Trajectory Management Framework
Trajectory authorisation & revision using datalink

Performance Based Navigation
Cruise climb
Free routing

Approach Procedures with Vertical Guidance

Optimised RNP

Dynamic vortex separation
Continuous Climb & Descent

Low Visibility procedures using satellite GBAS

Enhanced situational awareness

Integrated Departure & Arrival Manager

Integrated Controller Working Position

Pilot Enhanced Vision

Arrival & Departure Management

Enhanced situational awareness
Brake to vacate
Surface planning & routing

Remote Tower

Network Management

Ground safety nets
Surveillance
Ground System Enhancement

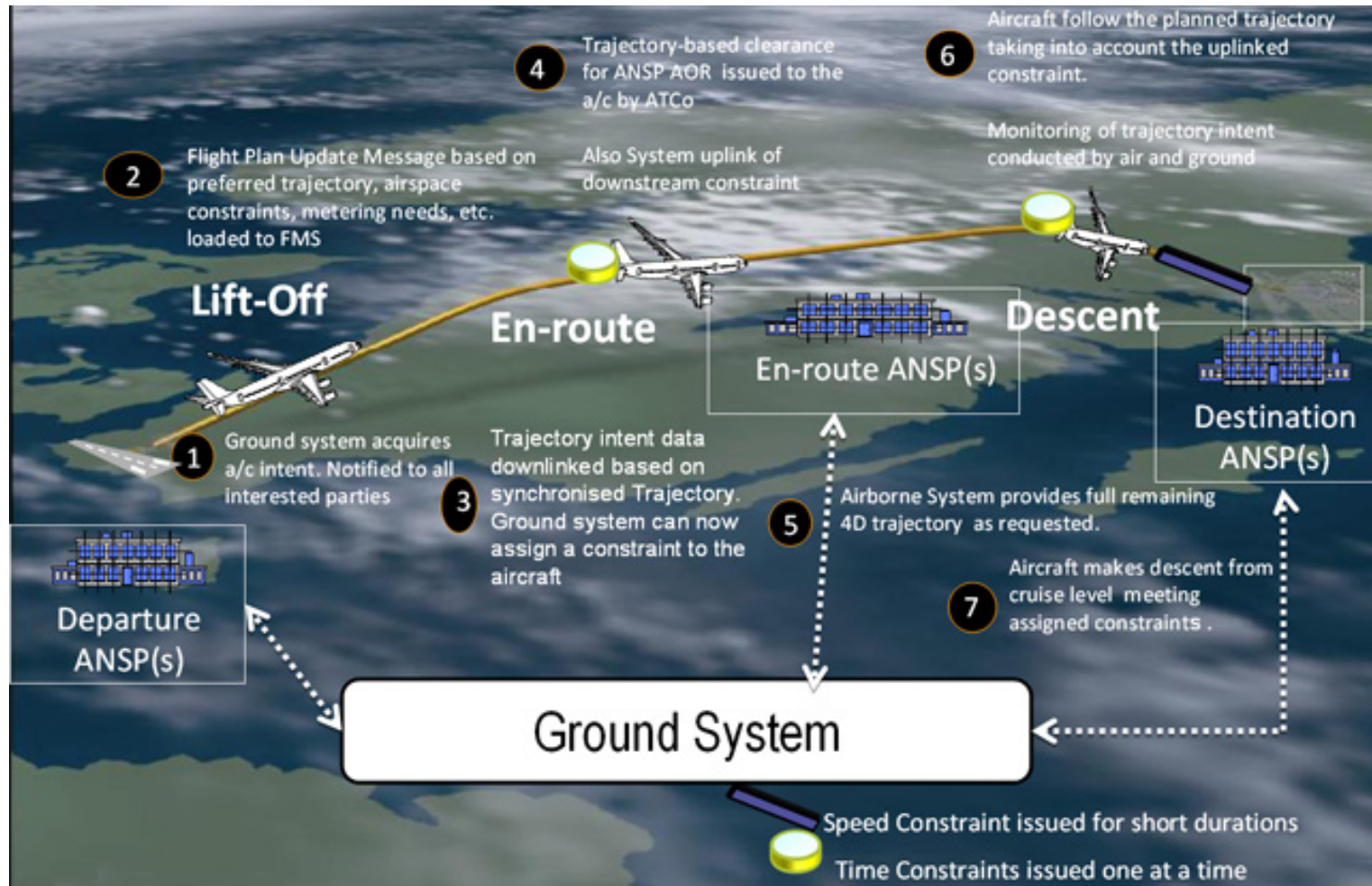Advanced Flexible Use of Airspace
Enhanced ATFCM Process

Sector Team Operations

Enhanced Short Term Conflict Alert

Conflict Detection & Resolution

Integrated Controller Working Position

User Driven Prioritisation Process

30

System Wide Information Management

Airport Operations Planning
Network Operations Planning

System interoperability with air & ground data sharing

Enhanced Decision Support Tools

In Practice..

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SESAR is Approaching the Deployment Phase

Definition phase

Create European ATM Master Plan

Development Phase

Develop new standards, operational procedures and technologies

Deployment Phase

Implement results of development to meet performance targets

Agreements Signature MAY 2009

06/2009 Launch

07/2009

400 contributors

20 projects

09/2009 Airlines on board

03/2010

1,500 contributors

300 projects

Today

3000+ contributors

30 validation exercises

15 SESAR Solutions

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Extension of SESAR Joint Undertaking

The High Level SESAR Programme Research and Innovation 2020 addressing remaining part of the European ATM Master Plan

0,1 Billion   1,2 Billion   0,3 Billion

Exploratory Research
Air Vehicle Operations & Technology
ATM Operations & technology
Airport Operations & Technology
System Architecture
ICT for Information Mgmt., Uncertainty & Optimisation
Safety
Security
Role of the Human in Automation and Ops. Change
Environment & Weather for Aviation
Enabling Change: Economics, Legal, Policy & Regulation

## Applied Research, Pre-Industrial Development, Validation

AIRPORT: Airport Terminal, Surface & Tower Systems	ATM: Airspace, Traffic Management & Systems	AIRCRAFT: Air Vehicle Operations, Mission Management & Integration	INFRASTRUCTURE: ICNS, Training & Simulation Systems
Priority Business Needs – ATM Key Features & Enablers			
Operations, Technical Interoperability & Performance			
Remotely Piloted Air Systems (RPAS) Integration			
System(s) Architecture			
Safety & Security Management			
Societal Challenges			
Regulation & Standardisation Planning			
European ATM Master Plan Maintenance			
Preparation for Deployment			

Large Scale Demonstrations
Airspace Users
Air Navigation Service Providers
Supply Industries
Airports
National Authorities
Staff Associations
ESA

Virtual centres

Status quo	"Virtual Centre Model"
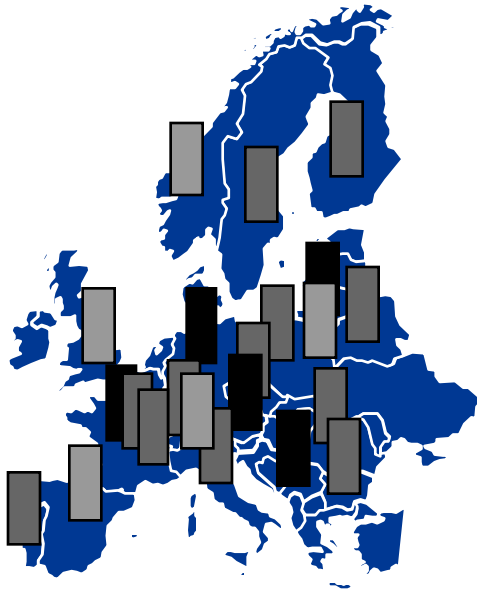
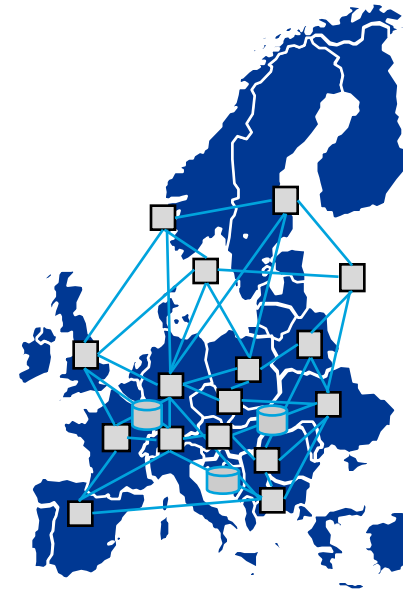**~68x ANS centres in Europe**

**Lack of standards
& interoperability**

Inefficient use of infrastructure
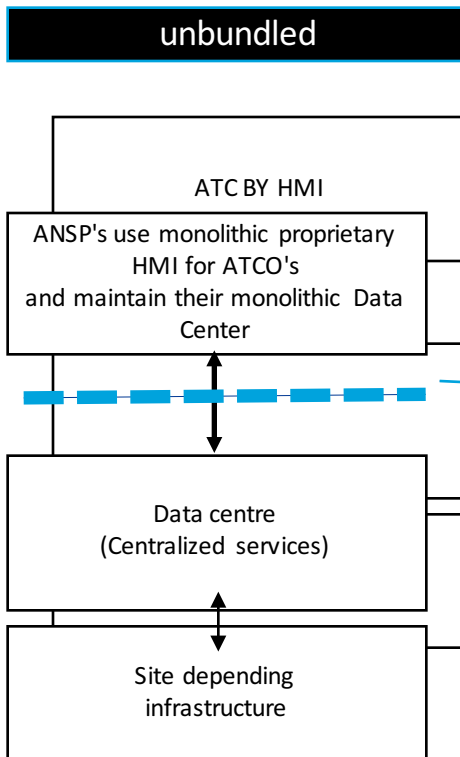
«On» & «off» Air Traffic Service Centres (ATSUs)

Interoperability through standards

Efficient use of infrastructure

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Unbundling of Services & Consolidation of Infrastructure

As-is	unbundled	Virtual Centre Model

As-is

ATC BY HMI

ANSP's use fully integrated HMI's for ATCO's (OPS)
Inside a proprietary, monolithic Systems

| EDP | RDP | FDP | COM |

unbundled

ATC BY HMI

ANSP's use monolithic proprietary HMI for ATCO's
and maintain their monolithic Data Center

Data centre
(Centralized services)

Site depending infrastructure

Virtual Centre Model

ATC BY **CCC**   ATC BY **CCC**

ANSP's use open standardized and interfaced CWP / CCC

Data centre
(Centralized services)

Site depending infrastructure

**ANSPs are monolithic
and use monolithic Systems**

**ANSP's and it's Systems are
unbundled to main service layers**
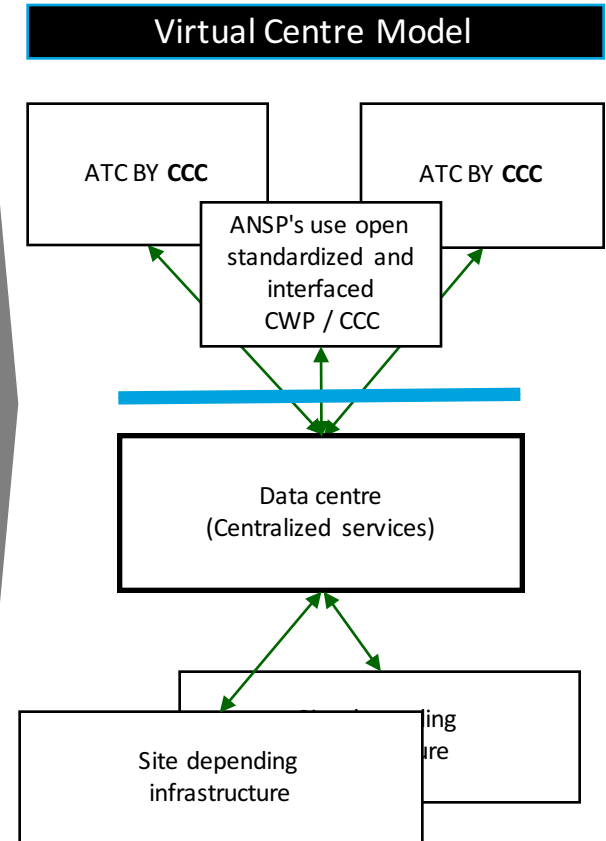
**Consolidation / Centralization
of
Data Processing and Data
Service Provisioning**

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Remote Tower operations

Luftfartsverkett (LFV) "Virtual Tower" for operating Sundsvall Airport, Sweden
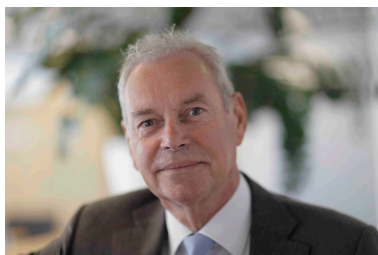
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Website: www.movingdot.nl

MovingDot can be reached by car and by public transport. From Amsterdam Schiphol Airport the traveling time is less than 10 minutes.

Questions please..

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Experts in air traffic management

Experts in Air Traffic Management

Bridging the gap between policy and operations